CLAIMS

1. A carbon nanotube polymer composite material, comprising:

a polymeric solid state continuous phase comprising one or more polymer chains;

one or more carbon nanotubes dispersed in the continuous phase, and

a bonding agent for mechanically coupling the one or more polymer chains to the one or more carbon nanotubes, the bonding agent joined to the polymer chain and non-covalently bonded to the carbon nanotube.

2. The composite of claim 1, wherein each carbon nanotube is aligned substantially parallel to one another.

3. The composite of claim 2, wherein a modulus of the composite material along a direction of the alignment of the one or more carbon nanotubes is at least about 250 GPa at 25 C.

4. The composite of claim 1, wherein the composite material is bio-compatible.

5. The composite of claim 1, wherein the one or more carbon nanotubes comprise from about 0.1 to about 20% by weight of the composite.

6. The composite of claim 1, wherein the bonding agent comprises a multifunctional molecule that includes a planar pyrenyl group.

7. The composite of claim 1, wherein the one or more polymer chains are selected from rubber, polyester, polystyrene, latex, polyethylene, epoxies, polyacrylates, or blends or combinations thereof.

8. The composite of claim 1, wherein the one or more polymer chains comprise a biocompatible polymer selected from silicone elastomers, poly(ethylene-co-vinyl acetate), polyacrylates, or combinations thereof.

9. A method for forming carbon nanotube polymer composite materials, comprising the steps of:

mixing a bonding agent having active groups on each of its ends with a polymer solution to form a functionalized polymer solution comprising one of the ends of the bonding agent bonded to the polymer,

blending the functionalized polymer solution with a carbon nanotube material to form a nanotube polymer composite, wherein the other of the ends of the bonding agent is non-covalently bonded to the carbon nanotube.

10. The method of claim 9, wherein the bonding agent is non-covalently bonded to each carbon nanotube using pi-bonds.

11. The method of claim 9, further comprising the step of drawing the composite material, wherein each carbon nanotube becomes aligned substantially parallel to one another.

12. The method of claim 9, wherein the blending step comprises polymerizing the bonding agent into the polymer.

13. The method of claim 9, wherein the carbon nanotube material comprises from about 0.1 to about 20% by weight of the composite.

14. The method of claim 9, wherein the bonding agent comprises a multifunctional molecule that includes a planar pyrenyl group.

15. The method of claim 9, wherein the polymer is selected from rubber, polyester, polystyrene, latex, polyethylene, epoxies, polyacrylates, or blends or combinations thereof.

16. The method of claim 9, wherein the polymer is a biocompatible polymer selected from silicone elastomers, poly(ethylene-co-vinyl acetate), polyacrylates, or combinations thereof.

17. The method of claim 9, further comprising the step of heating the mixture to a suitable temperature to complete polymerization.